SWORN STATEMENT OF JOHN P. WIKSWO, JR., Ph.D

COUNTY OF DAVIDSON )
)
STATE OF TENNESSEE )

Affiant John P. Wikswo, Jr., swears as follows:

1. I hold a Bachelor's Degree in Physics from the University of Virginia, a Master's Degree in Physics from Stanford University, and a Ph.D. in Physics from Stanford University. I am the Founding Director of the Vanderbilt Institute for Integrative Biosystems Research and Education (VIIBRE), and at Vanderbilt University I am the Gordon A. Cain University Professor, A.B. Learned Professor of Living State Physics, and a Professor of Biomedical Engineering, Molecular Physiology & Biophysics, and Physics.

2. I began investigating and considering judicial electrocution protocols and electrocution equipment in 1992. I have continued to do so for the past twenty plus years.

3. The electrocution protocols and equipment I have reviewed during the past twenty plus years were designed to administer to a prisoner a 60 HZ alternating electrical voltage of between 1,500 and 2,500 volts and a current of 4 to 10 amps.

4. The electrocution protocols and equipment I reviewed accomplished this result by attaching to seated prisoners electrodes to the prisoners' heads and lower legs.

5. In the course of reviewing the electrocution protocols and equipment described above:

5.1. I reviewed scientific literature concerning the application of electrical current to living organisms.

5.2. I reviewed scientific literature describing the physiological trauma associated with lightning strikes, electrocution in industrial accidents, and electroconvulsive therapy.

5.3. I reviewed non-scientific material relating, among other things, anecdotal accounts from persons who have come into contact with a high voltage electrical current.

5.4. I reviewed autopsy reports of electrocuted prisoners.

5.5. I read statements from persons who witnessed judicial electrocutions of prisoners.

5.6. I conducted my own research.

6. After reviewing the electrocution protocols and equipment described above, I arrived at the following conclusions and opinions about them:

6.1. Prisoners can remain alive for some period of time during the electrocution event. I base this conclusion on the following:

6.1.1. A prisoner's heart will not necessarily stop instantaneously when the high voltage electrical current contacts the prisoner's body.

6.1.2. Even when contact with high voltage electrical current causes a prisoner's heart to stop beating, when the current ceases there is a high probability that the prisoner's heart will resume beating.

6.1.3. While there is a possibility that a prisoner's heart will enter a mode of excitation known as fibrillation during an electrocution execution, when the current ceases the prisoner's heart can resume a normal beating pattern.

6.1.4. Even when a prisoner's heart fibrillates for an extended period of time during an electrocution execution, death does not occur instantaneously. Rather, death results over a period of time as the fibrillation of the prisoner's heart reduces cardiac output to the point that it is insufficient to maintain life.

6.1.5. When high voltage electrical current contacts a prisoner, the skeletal muscles he requires for breathing tetanize, and the prisoner cannot breathe to supply oxygen and eliminate carbon dioxide. Thus, a prisoner subjected to an electrocution execution described above dies from asphyxiation and/or organ damage due to thermal heating, i.e., cooking. These processes require a period of time to produce death.

6.1.6. No scientific evidence contradicts the above statements.

6.2. Prisoners can remain conscious and sensate for some period of time during the electrocution event. I base this conclusion on the following:

6.2.1. A prisoner will lose consciousness during an electrocution event through loss of brain function. Loss of brain function occurs through (1) a direct assault on the brain; or (2) insufficient blood circulation to the brain due to cardiac fibrillation or asphyxia.

6.2.2. Upon contacting the prisoner's body at the top of his head, the electrical current follows to the leg electrodes paths of least resistance. The prisoner's skull presents the current a resistance significantly greater than the resistance the prisoner's skin presents. As a result, the vast majority of the electrical current travels around the perimeter of the prisoner's head and down the prisoner's torso and legs until it leaves his body through the leg electrodes. As the current alternates, it follows like paths of least resistance in the opposite direction.

6.2.3. Because the skull effectively insulates the brain from the electrical current flowing from and to the head electrode/sponge, the electrical current does not immediately incapacitate the prisoner's brain. Rather, the ability of the prisoner's brain to function becomes

compromised over time by (1) the reduced portion of the current that reaches the prisoner's brain; (2) indirect thermal transfer through the skull; (3) indirect thermal transport through the blood vessels of the prisoner's neck; and (4) loss of oxygen.

6.2.4. While the reduced portion of electrical current that reaches the prisoner's brain may, on occasion, depolarize a prisoner's brain, there is no scientific evidence that the prisoner's depolarized brain neurons will thereafter be incapable of repolarizing during the alternating current stimulation.

6.2.5. Should depolarization of a prisoner's brain occur, a 60 HZ alternating current provides for repolarization of the prisoner's brain.

6.2.6. No scientific evidence contradicts the above statements.

6.3. Because prisoners can remain alive, conscious, and sensate during at least a portion of the duration of a judicial electrocution event, for the following reasons they can experience excruciating pain and suffering during the event:

6.3.1. When the high voltage electrical current contacts a prisoner and travels through his body it burns him, causing extreme pain.

6.3.2. When the high voltage electrical current contacts a prisoner and travels through his body it thermally heats, i.e., cooks, his body and internal organs, causing extreme pain.

6.3.3. When the high voltage electrical current contacts a prisoner and travels through his body it directly excites most if not all sensory, motor, secretory, and autonomic nerves along the paths the current follows, causing extreme pain.

6.3.4. When the high voltage electrical current contacts the prisoner and travels through his body it can excite some brain neurons, causing extreme pain as well as sensations of sound, light, dread, and fear.

6.3.5. When the high voltage electrical current contacts the prisoner and travels through his body, his skeletal flexor and extensor muscles simultaneously tetanize, causing extreme pain. The muscles will remain tetanized until the current ceases.

6.3.6. When the high voltage electrical current contacts the prisoner and travels through his body, the skeletal muscles he requires for breathing tetanize, and the prisoner can neither inhale nor exhale. As a result, the prisoner experiences the sensation of suffocating. The intense metabolic demands of muscle tetany aggravate the prisoner's sense that he is suffocating.

6.3.7. The prisoner's perception of time during the electrocution process can become distorted so that he may perceive (1) each of the sixty per second alternating cycles of

knee area of the left leg was blanched and the area below the left knee above the electrode was red and the color rapidly became more conspicuous. Fluid began to drip from the area surrounding the electrode on Mr. Joubert's calf. Mr. Joubert's fingers were still curled into tight fists and his nose and the top of his head were still swollen. Again, Mr. Joubert's head snapped to the back of the electric chair and his feet curved inward making him look pigeon-toed. I detected a fait scent of burnt flesh. Mr. Joubet's skin color changed from red to purple. This lasted for approximately thirty seconds.

15. I then observed Mr. Joubert's jumpsuit deflate and his body pulled back to the seat, back, arms and legs of the electric chair. This lasted for approximately ten seconds. The color of Mr. Joubert's skin remained purple and his fingers stayed curled in tight fists.

16. At or about 12:16 a.m. on July 17, 1996, and for the fourth time, I heard a "clunk" sound and again at the same time saw Mr. Joubert immediately puff up. The knee area of the left leg remained white and the area below the left knee and above the electrode remained red. Fluid continued to drip from the area surrounding the electrode on Mr. Joubert's calf. Again, Mr. Joubert's head snapped to the back of the electric chair and his feet curved inward. Mr. Joubert's fingers were still curled into tight fists and his nose and the top of his head were still swollen. Mr. Joubert's skin color began to change from purple to charcoal. The charcoal color of the hands was darker than the color of Mr. Joubert's head. This lasted for approximately twenty to thirty seconds.

17. At or about 12:16 or 12:17 a.m. on July 17, 1996, I observed Mr. Joubert's jumpsuit deflate as his body pulled back to the seat, back, arms and legs of the electric chair. Mr. Joubert's head was bent forward, slightly to the right. The color of Mr. Joubert's skin began to change from a light charcoal color to a darker charcoal. Mr. Joubert's feet were still curved inward, making him look pigeon-toed and his hands stayed curled in tight fists. Mr. Joubert's nose and the top of his head were still swollen.

18. At or about 12:21 a.m. on July 17, 1996, an individual who appeared to be an officer with the Lancaster County Sherriff's Department entered the execution chamber from the left side of the electric chair. He went behind the electric chair and to the right side of the electric chair. The officer

electrical current; and (2) the electrical trauma as lasting dramatically longer than it would appear to a bystander.

6.4. Because contact with high voltage electrical current causes muscle tetany, and because the electrocution protocols I reviewed command that the prisoner be harnessed tightly onto the electrocution equipment, during an electrocution execution a prisoner is unable to signal that he is experiencing pain and suffering.

6.5. Because of the unpredictability and variability of each prisoner's electrical resistance and that of the connections to his body during an electrocution execution, the current delivered to each prisoner will vary significantly from the currents delivered to other prisoners. As a result, the time individual prisoners remain alive, conscious, and sensate are unknown and will vary substantially from prisoner to prisoner.

6.6. Because prisoners can remain alive at the conclusion of an electrocution execution, the electrocution protocols I reviewed provided that after the executioner shuts off power to the electrocution equipment, a medical doctor wait for a period of time, usually four to five minutes, before the doctor examines a prisoner's body for signs of life. During this five minute period, prisoners who survive the electrocution process die from thermal heating, i.e., cooking, of their vital organs, and asphyxiation.

7. Attorneys working for the Office of the Federal Public Defender, Middle District of Tennessee, asked me to review:

7.1. a Tennessee Department of Correction document titled Execution Procedures For Electrocution (hereafter Tennessee Electrocution Protocol).

7.2. a 11/2/07 Report of Examination by County Medical Examiner concerning the September 12, 2007, judicial electrocution of Daryl Holton.

7.3. a 10/29/07 Autopsy Report concerning a post mortem examination of Holton's body.

7.4. a 10/30/07 Report of Microscopic Examination conducted as part of the Holton post mortem examination.

7.5. Color copies of photographs taken during the Holton post mortem examination.

7.6. Color copies of photographs taken concerning materials used in the Holton electrocution.

7.7. Color copies of photographs of clothing.

7.8. Color copies of photographs depicting the scene of the Holton electrocution after it was carried out.

7.9. Newspaper accounts of the events that occurred during the Holton electrocution.

8. Based on my review of the material described in Paragraph 7, above, and my consideration of that material in conjunction with the material described in Paragraph 5, above, I conclude and opine as follows:

8.1. The Tennessee Electrocution Protocol calls for (1) an initial twenty second application of a 1,750 volts, 7 amps, 60 HZ alternating electrical current; (2) a fifteen second "disengage" period; and (3) a fifteen second "re-engage" period again applying a 1,750 volts, 7 amps, 60 HZ alternating electrical current.

8.2. Tennessee's electrocution equipment requires the prisoner to sit in a chair. Electrodes are attached to the seated prisoner's head and lower legs, and cables connected to a high-voltage transformer deliver the stated voltage to the prisoner.

8.3. The initial twenty second application of electrical current will not provide a time long enough for a prisoner to die because (1) electrical current applied during an electrocution execution will not necessarily stop the prisoner's heart; and (2) the skeletal muscles the prisoner requires for respiration will relax when the current stops, and air will flow into the prisoner's lungs. During the fifteen second "disengage" period, a prisoner's heart can circulate the newly oxygenated blood to the brain and the rest of the prisoner's body, keeping him alive, possibly conscious, and possibly sensate for the second application of electrical current.

8.4. Because Tennessee's Electrocution Protocol and electrocution equipment is consistent with the electrocution protocols and equipment I previously reviewed, my conclusions and opinions expressed in Paragraph 6, above, apply to the Tennessee protocol and equipment. Specifically, prisoners executed using Tennessee's Electrocution Protocol and electrocution equipment can, for some period of time, remain alive, conscious, and sensate during the electrocution event and can experience the excruciating pain and suffering associated with the phenomena that occur when a high voltage electrical current contacts a human being.

8.5. A review of newspaper accounts of the Daryl Holton electrocution and documents and photographs created during the post mortem examination of Daryl Holton's body confirm my conclusion and opinion that (1) prisoners electrocuted using the Tennessee Electrocution Protocol and Tennessee's electrocution equipment can remain alive, conscious, and sensate for some period of time during the electrocution process; and (2) as a result can experience excruciating pain and suffering during that process. Specifically:

8.5.1. The Autopsy Report describes burns "above and behind the left ear, above the right ear, the right side of the forehead," and "the anterior and posterior aspects of both calve." These burns, shown clearly in the autopsy photographs, are consistent with the thermal heating that occurs as the electrical current passes between the electrodes and the prisoner.

8.5.2. The Autopsy Report describes thermal burns on the anterior and posterior portions of the neck. These burns, evident in the corresponding autopsy photographs, are consistent with a substantial electric current flow through the skin and soft tissues of the neck, which in turn would have been a result of the electrical insulating properties of the bones of the skull that would have prevented substantial current from passing through the brain and the spinal cord.

8.5.3. A narrow line of burns on the anterior neck evident in autopsy photographs is consistent with the collar of the shirt being wet from the saline applied to the scalp electrodes, and thus allowing a high current to flow superficially between the skin and the wet cloth, again consistent with a large portion of the current being carried by the skin and soft tissues of the neck.

8.5.4. The Autopsy Report describes thermal burns to the hands. These burns suggest that the electric current found an alternative path between the head and calf electrodes.

8.5.5. The Autopsy Report describes burns to the lower back and the right thigh. These burns are consistent with the electrical current flowing through these regions, and the absence of symmetrical burns to the left thigh indicates that there can be substantial differences in the current distribution within each leg.

8.5.6. The Autopsy Report describes burns on the left popliteal fossa. These burns are consistent with electric current flowing preferentially through the soft tissues behind the knee instead of through the insulating bone structures within the knee.

8.5.7. The burns shown in the autopsy photographs were substantially more severe and hence much more painful than what might be encountered with a "severe sunburn."

8.5.8. The Autopsy Report describes superficial blunt force injuries and abrasions to the scalp, forehead, chin, foot, upper arms, and calf. These injuries are consistent with the witness reports of the prisoner jerking against the straps and electrodes after application of the electric current and the resulting muscle contraction and tetany.

8.5.9. There was no report of discoloration of the dura underneath the head electrode, reported in other executions by electrocution. The lack of such a description is consistent with the current flowing in the scalp and any underlying soft tissue rather than penetrating the skull, which is relatively insulating as compared to the scalp and underlying soft tissues.

8.6. A review of the Tennessee Electrocution Protocol reveals a number of scientific and technical issues. Specifically:

8.6.1. The Tennessee Electrocution Protocol indicates on page 19 that the physician should "examine the body for vital signs five minutes after the electrical current ceases." There is no rationale provided for the specification of that time interval. It is likely that were the prisoner's heart still beating after the termination of the last application of voltage, then the prisoner would die from asphyxiation during that interval, thereby leading to cessation of the heartbeat well after the termination of the applied voltage. Body heating during electrocution would not be so great as to make it necessary to wait five minutes for the body to cool.

8.6.2. The Tennessee Electrocution Protocol states on page 34 that "While the electric chair is activated, the Facility Maintenance Supervisor and his assistant will assure that the designated voltage (1,750) and amps (7) are being delivered." Given that the electrical resistance of the prisoner is unknown prior to the electrocution procedure and may vary during that procedure it is impossible by the laws of physics in general and Ohm's law in particular, to guarantee that BOTH criteria stated on Page 34 and elsewhere in the Tennessee Electrocution Protocol of 1,750 volts AND 7 amps are met. There is no provision in either the Tennessee Electrocution Protocol or the design of the electric chair to ensure that both of these criteria can be met simultaneously, and hence I find the Tennessee Electrocution Protocol to be inaccurate from both the scientific and engineering perspective.

8.6.3. Furthermore, because of the series electrical resistance of the transformer wiring, cables, sponges and the contacts with the prisoner's skin, the voltage actually applied to the prisoner is somewhat less than the 1,750 volts that are delivered at the output of the open-circuit transformer. The current delivered to the prisoner will be actual applied voltage divided by the resistance of the prisoner, which is expected to change during the course of the electrocution as the skin burns, the water in the salt water is heated and then converted into steam, and the tissue under the skin potentially chars.

8.6.4. The requirement stated on page 42 of the Tennessee Electrocution Protocol that the exhaust fan must be turned on suggests the possibility of the generation of either smoke or fumes from burning human flesh during the execution process. The presence of a fire extinguisher (Page 67) suggests the possibility of an electrical fire, as has occurred during multiple judicial electrocutions.

8.6.5. There is no scientific basis for the requirement, stated on page 42 of the Tennessee Electrocution Protocol, that the electrocution cycle requires the delivery of 1750 V and 7 A for 20 seconds, with disengagement for 15 seconds, followed by re-engagement for 15 seconds.

9. Based on the foregoing, I conclude to a reasonable degree of scientific certainty that there is a substantial risk that a prisoner electrocuted using Tennessee's Electrocution Protocol and electrocution equipment will remain alive, conscious, and sensate for some period of time during the electrocution process and, as a result, will experience for some period of time the excruciating pain and suffering associated with the phenomena that occur when a high voltage electrical current contacts a human being.

FURTHER AFFIANT SAITH NAUGHT

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STATE OF TENNESSEE

COUNTY OF DAVIDSON

Sworn and subscribed before me on this the 14th day of November, 2014.

NOTARY PUBLIC

My commission expires:

5/8/2017
Date

JANET Y. SANTANA NOTARY PUBLIC STATE OF TENNESSEE DAVIDSON COUNTY, TENN.